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25 November 1970  
SG-70/403

MEMORANDUM FOR: Executive Director-Comptroller

THROUGH : Deputy Director for Plans

Chairman, Information Processing Board

SUBJECT : Rental Order for Replacement Computer and Related  
Peripherals

1. In paragraph 16 your approval is requested for a rental order to replace an IBM 1410 computer system with an IBM 370/155 system.

2. The DDP is in a situation from both a hardware and software position where we now believe it imperative that two second generation computers (2 - IBM 1410's) be replaced with one third generation computer (IBM 370/155). This will be a phased conversion with one 1410 being moved out to make space for the 155. The second 1410 will be removed as soon as it can be determined that the programs remaining on the second 1410 can be run on the 155.

3. The DDP has a history of increasing its computer capacity only as required. This history begins in 1959 with the installation of a small 650 computer--the first computer in the Agency. In 1961 the 650 was supplemented by a small 1401. With the move to the new building (Feb 62) the 650 was left in K Building and a 1410 (40K) with disk was activated in Headquarters Building. As requirements built up the 1410 was increased by adding a second channel, increasing core, increasing tape speeds and going through three models of disk storage devices. In July 1964 a second 1410 was added with both central processing units sharing the disk files. The 1401 was released. In October 1964 the 1410 Operating System was installed with a teleprocessing monitor and remote inquiry stations. This system is still in operation. In July 1964 it was decided that the automation of the main CS [REDACTED] Index could be undertaken only if based on experience derived from first automating a small subsection--the 201 index. With the announcement of IBM System/360, the CS, early in 1965, opted to stay with the 1410 system for 201 search to move gradually to System/360. This was done by starting with a 360/30 in November 1965, changing to a 40 in April 1967 and a 50 in March 1969. Each of these systems started small and were upgraded as needed.

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downgrading and  
declassification

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4. We have gradually been converting systems and programs from the 1410's to the 360. Many of the Operational Systems and miscellaneous subsystems have been converted and are now operational on the 360/50. The [REDACTED] Grouping System using display devices is almost ready to be transferred to the 360/50. Major systems still on the 1410's (with their estimated conversion dates) are:

- a. Document Control System (DCS) - June 1971
- b. General Information Collation System (GICS) - June 1971
- c. Abstract Processing - September 1971
- d. [REDACTED] Group System--(1410 system to support 201 search) - March 1972
- e. 201 Index Search-Special Index System (SIS) - March 1972
- f. Input Processing System (IPS) - December 1972
- g. Field Reconstitution of Index and Aperture Cards - December 1972

5. The DCS is basic to the CS's operations, controlling over 2 million records and limiting access to them by a Badge Table. It also records the location of official CS files and documents, the restrictions thereon, the locations of all the images in the [REDACTED] Document Files, and several other subsystems. This system is queried more than a thousand times daily. Thus, the DCS carries top priority for computer operations during the day shift and must be backed up hardware-wise. This system is currently being reprogrammed for the 360/50 and should be ready for changeover by June 1971. The 1410 system cannot serve as back-up for the DCS and must be replaced with one that will serve as back-up for the 360/50. At the same time it must be recognized that we will be forced to continue running some 1410 programs for some time to come, and this can only be done, in MVT, on a 370/155 which can both emulate the remaining 1410 programs and back-up the 360/50 system which will support the DCS.

6. The main ADP effort in the CS is found on the mechanization of the eight million record [REDACTED]. This is a three-phase effort starting with a sub-set--the [REDACTED] now being re-designed and re-programmed for the 360/50. The [REDACTED] is being designed so that during the second phase--a sample section of the Main Index--can be added for an operational test. If this operational test is successful then will come Phase III--loading and searching the main

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index over 4,000 times a day for other agencies, as well as for CIA's own needs.

7. As the Main Index is loaded to the computer and reliance is placed on the mechanized system for [REDACTED] tracing, it becomes necessary to provide assurance of 100% up time of this activity during prime shift. This will be done by providing two Central Processing Units (CPU) and back-up for all other equipment necessary to process the Index and DCS. Both of the CPU's will operate in an MVT environment--one processing the Index as its main task and the other the DCS. Either CPU will be able to assume the main task of the other but one of the main tasks must be operated in a degraded mode. The peripheral equipment will be capable of being switched to the active CPU.

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8. There does not seem to be much room for debate on the fact that RID should move to third generation computers. The 1410's and their I/O gear are slow, getting old, and do not have near the capability of later systems. The back-up for these computers outside our computer room is almost non-existent. The basic question is what will replace these systems. Since this memo was in first draft several new factors have emerged. IBM has announced the 370/145. In discussion with OCS, Mr. [REDACTED], Chief, Operations Division, has suggested the possibility of transfer of an Agency-owned 360/65 CPU from OCS to RID. This then presents four options for replacement equipment:

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|---------------------------|---------------------|
| a. A rental 360/50        | c. A rental 370/145 |
| b. An agency-owned 360/65 | d. A rental 370/155 |

9. Option a, renting another 360/50. The 360/50, has a core limitation of 524,000, but has the capability of attaching "Large Core Storage--LCS." This LCS (in our case 1,000,000 bytes--the minimum) is an extension of main core but is four times slower than main core. The increase has provided the capacity needed to debug some of our large PL/I programs, but the slow speed causes degraded performance and is a definite limiting factor in MVT production. The 50 will not support the new direct access storage device (3330). It is now in limited production and we expect to see it withdrawn from new production as the vendor gears up on System 370.

10. Option b, the Agency-owned 360/65, from a financial view appears most interesting. There are, however, some very serious drawbacks in this approach. One of the main problems is that the 65 will not support the new 3330. Considering the amount of direct access storage required (eight 2314's for the main index and three more for DCS and other applications) this presents an unacceptable operational

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environment--88 disk packs on line. We are not sure that we could cram that many disk packs into the RID computer center. Use of 3330's with 28 disk packs on line would give us slightly more disk storage and would afford a tremendous space difference. The space requirements of the 65 vs the same capacity 155 are much greater:

	<u>65</u>	<u>155</u>
Main Frame	18' x 21'	12' x 15-1/2'
Selector Channels	5-2/3' x 2-2/3'	-0-
Multiplexer Channels	5-2/3' x 2-2/3'	-0-
KVA	38.6	22.0
BTU's	126,300	66,000

The main frame of the 65 will not fit into the space available after the removal of the first 1410 in any arrangement that is even nearly acceptable. The 65 will not emulate 1410 programs.

11. Option c, the 370/145, must be ruled out because of memory limitations of 524,000. This has already been proven on the installed 360/50, where we were forced to add slow LCS to handle the programs we are running on it.

12. The advantages of Option d, the 155, with one million bytes of main core are:

- a. The increased processing speed of the CPU. All core of the 155 is high speed.
- b. Two million bytes of main core are available.
- c. The 155 will support the new direct access storage devices which are a requirement for the main index.
- d. The 155 provides an integrated emulator which will allow the continuation of 1410 programs under the Operating System in MVT until such time as these programs are converted to the new equipment (see paragraph 4., c. through g.).
- e. The 155 will provide greater throughput, reliability, and error checking.

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f. The 155 CPU is smaller than the 50 CPU--not including the 1 meg core storage.

g. Software for the 50 will run on the 155 under the same operating system.

13. The factors that argue against the 155 are that it is a new machine and RID will be receiving an early one off the production line. This is recognized as presenting some problems. However, unlike the early System 360 fiasco, software is here now and there are six (6) 370/155's now in use by IBM which will have been in use for ten months before our scheduled delivery date. We have questions about the software for the integrated emulator and tests will be run at IBM (on a limited basis due to classified data bases) after January 1971. For this reason, one 1410 will remain until the emulated programs are proven out.

14. The 360/50 with a limitation of 524,000 bytes of core has been too small for our operations. It was necessary to add bulk core (1,000,000 bytes) to enable continued debugging with large programs for the [REDACTED] System--the [REDACTED] system on the 360. The File Maintenance program alone will use 450K bytes. We have long known that direct access devices of greater capacity were in the offing and were concerned about the data transfer rate of these new devices and the capability of the 360/50 to handle these data rates. The announcement of System 370 with the 155 CPU, its first delivery date of February 1971 and additional direct access storage capacity to be available later in the year, seems to be almost "tailor-made" for the DDP's schedule and convenience.

15. Cost comparisons of the 1410 computers vs. the 370/155 are detailed in Tab A. The initial replacement of one 1410 by the 155 will increase the monthly rental by \$40,441. This amount of increase will only last until the programs to be emulated are operational under the integrated emulator at which time the last 1410 will be released. This will leave a net increase in monthly rental of \$1,227 (see recap Tab B). Included in the replacement costs are upgradings of capacity and capability beyond the CPU:

a. All I/O equipment with the exception of Tape Units will be switchable to either computer.

b. Direct access storage will be increased by 248 million bytes.

c. The 2302 Disk Units with fixed disks will be replaced by 2314 Disk Units that have removable Disk Packs and access time will be reduced.

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d. Remote terminal capability will be significantly increased.

e. Printing speed will increase from 600 lpm to 1100 lpm on one printer.

f. There will be one less card read punch, but the speed of reading will be increased from 800 to 1000 cpm and the speed of punching from 250 to 300 cpm. (From experience, the new machine (2540 vs. 1402) is much more reliable.)

g. The console will print at 85 cps as opposed to the 15 cps present consoles.

The replacement of the two 1410's has been in our program plan for a number of years and the cost increase is covered in the RID budget.

16. It is recommended that you approve the issuance of a rental order by Procurement Division to replace one 1410 system and its peripherals with an IBM 370/155 system and its peripherals as detailed in Tab A.

  
Chief, DDP/SG

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Attachments

Concur:

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Deputy Director for Plans

\_\_\_\_\_  
Date

\_\_\_\_\_  
Chairman, Information Processing  
Board

\_\_\_\_\_  
Date

Approved:

\_\_\_\_\_  
Executive Director-Comptroller

\_\_\_\_\_  
Date

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C O S T    C O M P A R I S O N S

	<u>1410 #1</u>		<u>1410 #2 (First Out)</u>		<u>370/155</u>	
CPU	1	100K \$10,003	1	100K \$10,003	1	No Core \$19,650
Core Storage					1	MEG 12,000
Console	1	1415 281	1	1415 281	1	3215 200
Tape Units	8	729 5,800	8	729 6,292	6	2420 3,390
Tape Control	2	1414 1,958	2	1414 1,958	2	2803 3,120
Printer	1	1403 875	1	1403 750	2	1403 1,770
Card Read-Punch	1	1402 595	1	1402 595	1	2540 685
I/O Control	1	1414 2,480	1	1414 2,238	2	2821 1,805
					1	2702 1,245
					1	2848 945
					3	ILLEG 15,865
Direct Access Storage	2	2302 15,780				
Direct Access Storage Control	1	7631 1,345				
Print Train	1	1416 97			2	1416 194
Tape Switch			1	7155 63	1	2914 1,166
Control Unit Switch			6	1051 695	6	1051 606
Terminals			6	1052 384	3	1052 198
			3	1056 234	6	1058 552
			3	1058 276	1	1053 49
					3	2260 150
					4	2740 620

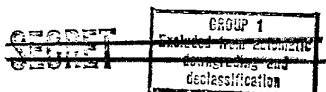
\$39,214

\$23,769

39,214

\$62,983

\$64,210 + \$1,227



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TAB "B"

C O S T    R E C A P

<u>Units</u>	<u>2-1410s</u>	<u>1-370/155</u>	<u>Net Change in Monthly Rental</u>
CPU, memory, console	\$20,568 (2)	\$31,850 (1)	\$11,282 +
Tape Unit	12,092 (16)	3,390 (6)	8,702 -
Tape Controller	3,916 (4)	3,120 (2)	796 -
Printer	1,722 (2)	1,964 (2)	242 +
Card Read Punch	1,190 (2)	685 (1)	505 -
I/O Controller	4,718 (2)	3,995 (4)	723 -
Storage & Control	17,125 (*)	15,865 (**)	1,260 -
Switching	63	1,166	1,103 +
Remotes	<u>1,589</u>	<u>2,175</u>	<u>586 +</u>
	\$62,893	\$64,210	\$ 1,227 +

(\*) 2-2302 Disk Storage &amp; Control 452 million bytes

(\*\*) 3-2314 Disk Storage &amp; Control 700 million bytes

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